Tropical Medicine and International Health

VOLUME 5 NO 12 PP 876–881 DECEMBER 2000

Child malaria treatment practices among mothers in the district of Yanfolila, Sikasso region, Mali

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Summary We studied child malaria treatment practices among mothers living in the District of Yanfolila in southern Mali. For sampling, we first chose five of 13 health areas with probability proportional to size. Then villages, compounds and mothers with at least one child aged 1–5 years were randomly chosen. We assessed the spleen size of one 1–5 year-old child of each mother, collected a thick blood film and recorded the body temperature of every child whose mother thought he/she was sick. 399 mothers in 28 villages were interviewed with a structured questionnaire divided into two parts. If the child had had *soumaya* (a term previously associated with uncomplicated malaria) during the past rainy season, we asked about signs and symptoms, health-seeking behaviour (who the mother consulted first) and treatment. If not, information about knowledge of the disease and treatment to be given was collected. 86% of the mothers interviewed stated that their child had been sick and almost half of them had had *soumaya*. All mothers named at least one sign by which they recognized the disease. Vomiting, fever and dark urine/yellow eyes/jaundice were the three most common signs mentioned. 75.8% managed their child's disease at home and used both traditional and modern treatment. The most common anti-malarial drug was chloroquine, often given at inappropriate dosage. The sensitivity and specificity of the mothers' diagnosis was poor, although this might be explained by the large percentage of children who had already been treated at the time of the interview. The results of our survey call for prompt educational action for the correct treatment of uncomplicated malaria/*soumaya*, particularly for mothers and possibly for shopkeepers. The high spleen rate (58.1%) among randomly selected children confirms that malaria is a common disease in this area. Improved case-management at home could only be beneficial.

keywords malaria, chloroquine, home case management

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Introduction

Early diagnosis and adequate treatment are the basic elements of any malaria control programme and should be seen as a fundamental right of all populations affected by malaria (WHO 1993). National programs (D'Alessandro 1998) should develop guidelines for case management and treatment on the basis of efficacy, side-effects, costs and compliance. However, most malaria cases are managed outside the formal health sector (Mwenesi *et al*. 1995) with drugs bought from shops or kiosks (Snow *et al*. 1992). This is especially true for uncomplicated malaria, and in poor, low-literacy populations with inadequate health service (Mwenesi *et al*. 1995). The practice of self-medication can be an advantage as a shorter delay between onset of disease and effective treatment has been linked to a lower risk of death (D'Alessandro *et al*. 1997). Unfortunately, the anti-malarial drugs used are not those suggested in the national guidelines (Djimde *et al*. 1998) and they

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are also given at sub-optimal dosage (McCombie 1996). As self-medication for malaria is so common that it is estimated that the unofficial drug sellers in markets, streets, and village shops account for as much as half of the anti-malarials distributed (Foster 1991), actual use patterns need to be described in order to implement effective corrective measures. These might not only improve case management at home, with obvious advantages for the patient, but might also decrease the misuse of anti-malarial drugs, thus delaying the emergence of resistance (Wernsdorfer 1991).

We report the results of a survey in several rural communities in southern Mali. Our objective was to describe mothers/guardians' therapeutic knowledge, attitudes and practices towards *soumaya*, a term describing a traditional disease entity in use in the study region and previously identified as overlapping the 'western' diagnosis of uncomplicated malaria (Diallo 1998). This study was also intended to provide the National Malaria Control Programme with accurate data for planning purposes.

Study sites and methods

The study was conducted in November 1998, at the end of the rainy season (June–November), in the 'circle' of Yanfolila, Sikasso Region, about 200 km south-west of Bamako. A 'circle' is the equivalent of a district, usually covering a population of about 150 000, with a 'centre de santé de cercle' (CSC), with functions similar to those of a district hospital, and several community health centres. The circle of Yanfolila covers an area of more than 9000 km^2; it is divided into 13 health areas and has a population of about 140 000. The major ethnic groups are the Fulani and the Malinké. Immigration from up-country has brought a large settlement of other people such as Dogon and Bozo. Only 6% are literate. Agriculture, fishing and cattle-rearing are the main economic activities. In this area malaria is holoendemic and one of the main causes of morbidity together with ARI (acute respiratory infection) and diarrhoea (Ecole Nationale de Médecine et de Pharmacie du Mali 1980). The major vectors are *Anopheles gambiae* and *Anopheles funestus* with a sporozoite rate of 6.4% at the end of the rainy season and an entomological inoculation rate of 0.032 infected bites per person per night (Fane, personal communication).

Sample size was computed on the basis of data from previous studies performed in the region of Mopti (Mali) (Thera *et al*. 1998). Sampling was done following different steps: five health areas among the 13 in the circle were chosen with probability proportional to size (Yanfolila, Kalana, Yorobougoula, Filanama and Gualala). Several villages from each area were randomly chosen. From each village 20 compounds were randomly chosen and in each compound one mother/guardian with at least one 1–5 year-old child was randomly selected; if none of the women living in the chosen compound had a child of the right age, another compound was randomly chosen. If a village had less than 20 compounds, then the closest village was chosen in order to complete the sample. A structured questionnaire was administered to the mother/guardian and spleen enlargement was assessed on one (randomly selected) of her 1–5 year-old children. The questionnaire was divided into two sections according to whether the randomly chosen child had had *soumaya* since the beginning of the rainy season. This represents a recall period of about 5 months. If yes, information about signs and symptoms, health-seeking behaviour (who was consulted first) and treatment was asked. If the child did not have *soumaya* during the past rainy season, i.e. had not been sick or had been sick for reasons other than *soumaya*, information about knowledge on *soumaya* and treatment was elicited. A thick blood film was collected from each child whose mother thought that he/she was sick at the time of interview. If none of her 1–5 year-old children was sick, another sick child from a different mother but living in the same compound was selected and a thick blood film collected. Mothers were asked to make their own diagnosis. Parasites were counted over 300 white blood cells (WBC) and parasite density per/μl computed assuming a mean WBC count of 8,000/μl. The axillary body temperature was recorded with a mercury thermometer (left in place for at least 5 min) and spleen enlargement assessed using Hackett's scoring system. This assigns scores from 0 to 5 with 0 corresponding to a non-palpable spleen and 5 to a spleen whose lowest point is beyond a line situated halfway between the umbilicus and the symphysis pubis (Gilles 1993). Uncomplicated malaria was defined as a body temperature $\geq$ 37.5 °C, parasite density between 2000/μl and 100 000/μl, and the absence of signs of severe malaria or any other disease (by clinical examination done by a medical doctor). This definition was used as the gold standard to assess sensitivity and specificity of mothers' (*soumaya*) diagnosis.

The correct dosage of chloroquine (CQ) was calculated for those children who had had *soumaya* during the last rainy season and whose mothers had treated them with CQ. As the weight of children was not available, optimal dosage of CQ was calculated on the basis of their age and was then compared with the dosage given by the mother. Correct dosage was defined as the one whose difference between optimal and given treatment was not inferior or did not exceed $\frac{3}{4}$ of a CQ tablet. Under-dosage was defined as dosage of at least $\frac{3}{4}$ tablet short of the recommended amount; over-dosage as dosage of at least $\frac{3}{4}$ tablet more than required.

Results

We interviewed 399 mothers in 28 villages. The mean distance

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Table 1 Signs associated with *soumaya* by the mothers whose child had *soumaya* during the rainy season

Signs	I sign (%) $n = 198$	II sign (%) $n = 131$	III sign (%) $n = 22$
Vomiting	58.1	23.7	4.5
Fever	27.8	29.0	18.2
Dark urine, yellow eyes, jaundice	6.6	15.3	4.5
Headache	1.0	0.8	18.2
Diarrhoea	1.0	15.2	36.4
Chills	1.0	3.1	9.1
Swollen abdomen	3.0	3.8	0.0
Others	1.5	7.6	9.1

Table 2 Reasons (first and second) given by the mothers whose child had *soumaya* during the rainy season for not attending the health centre

Reasons	I (%) $n = 276$	II (%) $n = 64$
No money	44	19
Soumaya is a simple disease	29	5
Correct treatment known	6	42
Lack of authorization	5	2
Traditional treatment known	4	8
Long distance to health centre	4	14
Drugs already at home	3	9
Others	5	2

between the villages and the nearest health centre was 10.5 km. The mothers' mean age was 27.6 years, most of them were farmers and more than 80% were illiterate (341/399). The mean number of children of all ages they took care of was 3.7, 1.5 for children under 5. Only 9.8% (39/399) of the women interviewed used a bednet. The mean age of the children sampled was 25.1 months. The spleen rate among the randomly chosen children was 58.1% (232/399) with 8.0% (32/399) scoring 3 or 4 on Hackett's classification. Most of the mothers interviewed (86%) stated that their child had been sick and almost half of them (198/399) had had *soumaya*. All named at least one sign by which they recognized the disease, 131 mentioned a second sign and 22 a third (Table 1). Vomiting, fever and dark urine/yellow eyes/jaundice were the three most common. Mothers whose child had not had *soumaya* in the past rainy season mentioned the above signs with similar frequency: vomiting (62.7% as I, 12.4% as II and 1.5% as III sign), fever (17.4% as I, 23.9% as II and 2.5% as III sign) and dark urine/yellow eyes/jaundice (9.0% as I, 10.9% as II and 1.0% as III sign). Health-seeking behaviour (whom the mother consulted first at the beginning of the illness) did not differ between mothers whose child had *soumaya* during the rainy season and mothers whose child had not had it. 75.8% of mothers whose child had *soumaya* during the rainy season answered that they managed the child at home, 12.1% asked advice of a member of the family, and only 7.6% sought advice and treatment from private nurses or the health centre. The remaining 2% sought treatment from traditional healer. When asked why they did not attend the health centre, 73% answered that they were unable to pay for the treatment or that *soumaya* is a simple disease that can be treated at home (Table 2). Other reasons were knowledge of the correct treatment, lack of authorization from the father, long distance to the health centre and having the required drug at home. Sixty-four mothers gave a second reason for not consulting at the health centre, the most common being knowledge of the correct treatment (Table 2). 67.2% whose child had recently had *soumaya* used modern and traditional treatment concurrently; 14.6% used only modern treatment and 18.2% traditional treatment. The mother herself had administered the latter in 85.1% of cases, only 2.5% of the women had consulted a traditional healer. More than 90% of those who used modern treatment gave an anti-malarial alone or in association with another drug. Only one mother reported the use of sulfadoxine-pyrimethamine (SP), all others used CQ. Paracetamol, aspirin, promethazin, penicillin and indomethacin were most frequently used in association with CQ. 38% of mothers had bought the treatment from a shop, 19.4% from a pharmacy and 31.6% from a store linked to the health centre. This is a shop staffed by a trained drug seller who is supervised directly by the health centre's medical doctor. The mean cost of such treatment was FCFA 152 (US$ 0.25), but some women paid more than FCFA 1000, usually for a bottle of chloroquine syrup, the highest price being FCFA 2400. More than half of CQ treatments were inappropriately dosed (Table 3) and given over a varying period of time. 99% of the mothers who had not recently treated their child for *soumaya* mentioned CQ as the only anti-malarial treatment they knew, only two knew SP. Even in this group of women dosage of CQ dosage was grossly

Table 3 Chloroquine dosage used by mothers whose child had *soumaya* during the rainy season

Chloroquine dosage (100 mg tbs)	% of children $n = 152$	Range difference between correct and given dose *
Under-dosage	35.5	− 1.0, − 2.75
Correct dosage	34.2	− 0.75, + 0.75
Over-dosage	30.2	+ 1.25, + 15.25

* Difference between optimal and actual number of given CQ tablets. The optimal number was calculated on the basis of the child's age.

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under- or over estimated. When asked where they received the information on CQ dosage, 40% of the women were unable to answer, 27.1% had it from a member of the family and 25.9% from the health centre. Only 6.5% stated that they had received some information from the shopkeepers.

At the time of the survey, 131 sick children were identified in the compounds visited and, according to their mothers, 58 (44.3%) were affected by *soumaya*. About half of these children (56.9%, 33/58) had already received some anti-malarial treatment. 20.7% (12/58) had undergone traditional treatment and the rest was untreated. 66% (37/56) of the children were reported to have started treatment within 24 h from the onset of disease, 21.4% (12/56) 2–3 days later and 12.5% (7/56) after 3 days.

Of the 131 sick children, 57 (43.5%) had peripheral parasitaemia with a density ranging from 80 to 213 600 parasites/μl. 88.9% had *P. falciparum*, 4.2% *P. malariae* and 6.9% a mixed infection of the two parasites. According to our definition only 20 children had uncomplicated malaria. The sensitivity and specificity of the mother's diagnosis were 40.0% and 54.9%, respectively, and its positive predictive value was 13.8%.

Discussion

Home treatment and self-medication for uncomplicated malaria is common (Slutsker *et al*. 1994; Mwenesi *et al*. 1995; Ruebush *et al*. 1995; Djimde *et al*. 1998) and our results confirm a situation that is probably prevalent throughout the African continent, at least in rural areas. However, practices and beliefs might vary between or even within a given country. For this reason locally generated data are important and should be considered when planning, implementing and evaluating control strategies. The results of our survey, while confirming a common pattern, also reveal some particularities that might be worthwhile considering.

In Yanfolila, malaria, or what is called *soumaya*, is considered an ordinary disease not requiring a visit to the local health centre for more professional advice, at least at the beginning of the illness. This is confirmed by the high percentage of mothers treating their children at home. A large proportion of the children found to be sick had been given some kind of treatment within 24 h from the onset of their illness, a result similar to what has been reported from Mopti (Thera *et al*. 1998). Although this is good news as prompt treatment has been associated with a lower mortality risk (D'Alessandro *et al*. 1997), it is striking that more than half of the mothers interviewed were unaware of the correct dosage, although the validity of the history provided can be questioned (Nwanyanwu *et al*. 1996). Despite the possible error allowed in the definition of under- and over-dosage ($\pm \frac{3}{4}$ tablet), more than a third of the mothers administered CQ at sub-optimal dosage while the other third gave a much higher number of tablets than required. Two mothers reported giving 14.5 tablets of chloroquine to their children aged between 12 and 47 months, one over only three days. There is a risk of intoxication when CQ use is as frequent as in this region of Mali, at least according to the declarations of the mothers. Severe CQ overdose may cause convulsions, coma, shock and respiratory or cardiac arrest. Children have died from doses as low as 300 mg (Benowitz 1994). Because of their uncontrolled use, the risk of intoxication with other drugs is also present, such as salicylate poisoning in Kenya (English *et al*. 1996). Frequent and sub-optimal use is an important selective factor for resistant parasites (Wernsdorfer 1991).

However, CQ continues to be recommended as the treatment of choice for uncomplicated malaria as the level of resistance, compared to other West African countries, is still very low in Mali (Plowe *et al*. 1996). Spread of CQ-resistant parasites would be particularly catastrophic in this setting. The difficulties of changing people's behaviour and switching from CQ to SP should be appreciated. An increase of childhood mortality and of case-fatality rates among malaria cases (Lackritz *et al*. 1992) would probably occur during the transition period, while the uncontrolled use of SP (under- or over-dosage), once accepted, could also have important consequences such as a faster spread of SP-resistant parasites. It has been suggested that the association of artemisinin derivatives with currently used anti-malarial drugs such as CQ might delay the appearance of resistance and increase the useful lifespan of a given drug (White & Olliaro 1996). There are a few trials underway in Africa on the therapeutic efficacy of the combination CQ/artesunate. Ideally, if this proves successful, it could be introduced as the first-line treatment before the emergence of CQ resistance. However, this should be considered only when the results of ongoing trials are available. The introduction of combination therapy through the health centres is unlikely to have much impact. Attendance (number of consultations over target population) is extremely low in Yanfolila town (9% in 1997 according to the National Health Information System), where the district hospital is situated. It is likely to be even lower in peripheral villages. We had confirmation of such a low attendance when we started a CQ sensitivity *in vivo* test at Yanfolila District Hospital. During our 2-week stay we were able to recruit just one patient fulfilling the entry criteria. Distance is probably an important factor (Carrin *et al*. 1993) although only 4% of the mothers interviewed reported it as the first reason for non-attendance: the mean distance between the villages we sampled and the nearest health centre was 10.5 km. Some are extremely difficult to reach by road, particularly during the rainy season. Probably the best strategy, at least at the beginning, would be to improve case management at home by edu-

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cating the population and the shopkeepers on the correct treatment. Educating shopkeepers has already been tried in Kenya and it has resulted in a dramatic change in behaviour (Marsh *et al*. 1999): an increase in the percentage of anti-malarial drugs sold in adequate amount and in the percentage of childhood fevers treated with an adequate dose of CQ. Combination therapy will be more expensive than CQ alone. However, it is obvious from our survey that mothers are used to spending money for the purchase of drugs and that some of them spent a relatively high sum. Should the treatment be rationalized, it would probably not cost much more than what they are spending now. The health and economical benefit of avoiding the unnecessary use of drugs such as indomethacin or promethazin must also be considered. Therefore, considering that resistance to CQ in this area is still relatively low and that the efficacy of the association CQ–artesunate is not yet known, a more rational use of CQ in presumptive malaria cases should be promoted.

A high proportion of mothers bought CQ at a pharmacy or a store linked to a health centre, the latter being staffed by a trained drug seller directly supervised by a medical doctor. In these places, it should not be difficult to stress to the mothers the importance of a correct CQ dosage and this could be done by educating the personnel of these facilities. In addition, information and education campaigns on the correct CQ dosage specifically targeted to mothers and to shopkeepers could complement the previous action.

Traditional treatment was widespread in Yanfolila and in the majority of cases it was the mother herself who prepared and administered it. Unlike Mopti town and Bandiagara rural area, where 20% and 70% of the malaria cases were, respectively, treated by traditional healers (Dicko 1995), this practice was quite uncommon in Yanfolila. A possible explanation is that mothers might have denied it if they perceived the interviewing team as belonging to the health services. However, if this were the case, they would have also hidden the use of traditional treatment. Consultation of traditional healers might be more frequent for severe cases. In Tanzania a locally defined illness characterized by fever and convulsions and called *degedege* was unanimously believed to require traditional treatment (Makemba *et al*. 1996). This area will require further investigation and, if a more frequent use of traditional treatment for severe malaria cases is confirmed in Yanfolila, support of traditional healers should be sought.

The sensitivity and specificity of mothers' diagnosis of *soumaya* were low. A similar finding has already been reported from Uganda (Lubanga *et al*. 1997). Although this is slightly disappointing, the lack of specificity compared to the results of a previous investigation (Diallo 1998) could be explained by the large percentage of children who had already received anti-malarial treatment and whose parasitaemia had probably decreased under our threshold of 2000 parasite/μl. This is plausible as more than half of the children reported to be sick had started their treatment within 24 h of disease onset. Another factor explaining low sensitivity and specificity could be the contrast between our strict definition of mild malaria and the non-specificity of the term *soumaya* (Roger 1992). Considering the large use of CQ by the mothers, their poor diagnosis is likely not to be an important factor in home case-management. Any febrile illness in children, particularly if associated with vomiting, will be treated with CQ, a cheap and easy-to-use drug and this will probably cover most cases of uncomplicated malaria.

In conclusion, our data call for an action aiming at promoting the adequate use of CQ in presumptive malaria cases. This could be done by stressing the importance of a correct CQ dosage through pharmacies and drug stores, a relatively easy thing to do, and by designing information campaigns targeted to mothers and shopkeepers. Once the results on the efficacy of the combination therapy (CQ–artesunate) are known, a decision will have to be taken whether to introduce it in Yanfolila, a place where CQ resistance is still low. Nevertheless and for the time being, the emphasis should be put on correct CQ treatment at home. The high spleen rate among randomly selected children confirms that malaria is common in this area. Improved case management at home could only be beneficial.

Acknowledgements

We dedicate this paper to the memory of Dr Anatole Diarra, Yanfolila Hospital's chief medical officer, who unfortunately died in a car crash in Mali a few months ago. Dr Diarra was a man completely involved in the work he was doing and he helped us greatly with the logistics involved in this project. We also thank all the facilitators and participants of the IVth International Course of Malariology, Bamako for their constructive critical assistance, and acknowledge the Course's organization team, the French Co-operation, the Belgian Co-operation, WHO/AFRO, the Institute of Tropical Medicine, France and the Faculty of Medicine, Pharmacy and Odontostomatology in Bamako for financial and technical support. We are especially grateful to the staff of Yanfolila Hospital and to the District Administration for logistical support. We thank the people of Yanfolila District for their understanding and compliance. Part of the study was funded under TDR/MIM Network grant No. ID 980152 and TDR/RSG grant no. 91036 FMPOS/INRPS.

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